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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/020,754	12/12/2001	Brian Lee	PR90-009	8676

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EXAMINER

CHEN, KIN CHAN

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 08/06/2003

Please find below and/or attached an Office communication concerning this application or proceeding.

# Office Action Summary

Application No.

10/020,754

Applicant(s)

LEE, BRIAN

Examiner

Kin-Chan Chen

Art Unit

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

## Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 14 July 2003.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-25 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-25 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on \_\_\_\_\_ is: a) ☐ approved b) ☐ disapproved by the Examiner.
- If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

## Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
- \* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
- a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

## Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413) Paper No(s). \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

1. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

2. Claims 1 and 6 are rejected under 35 U.S.C. 102(e) as being anticipated by Heo et al. (US 6,355,529; hereinafter "Heo").

In a method of forming a buried strap, Heo teaches providing a deep trench; forming a collar on the deep trench; filling the deep trench and overlying the collar with a silicon layer wherein the silicon layer forms a deep trench capacitor; recessing the silicon layer; etching away a top portion of the collar to leave a collar divot; selectively depositing a selective deposition layer of polysilicon into the deep trench and filling the collar divot to form the buried strap in the fabrication of the deep trench DRAM (Figs. 1A to 1G).

***Claim Rejections - 35 USC § 103***

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

4. Claims 2-5 and 7-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Heo et al. (US 6,355,529; hereinafter "Heo").

In a method of forming a buried strap, Heo teaches providing a deep trench; forming a collar on the deep trench; filling the deep trench and overlying the collar with a silicon layer wherein the silicon layer forms a deep trench capacitor; recessing the silicon layer; etching away a top portion of the collar to leave a collar divot; selectively depositing a selective deposition layer of polysilicon into the deep trench and filling the collar divot to form the buried strap; a doped polysilicon may be used (col. 1, lines 49-51) forming a shallow trench isolation region partially within the deep trench and the buried strap area. (Figs. 1A to 1G).

As to dependent claims 3 and 20, Heo teaches using polysilicon. Heo is not limited to any particular one, therefore, it would have been obvious to one with ordinary skill in the art to use heavy doped amorphous polysilicon because it is one of the most popular material for forming deep trench capacitor and buried strap, see Chakravarti et al. (US 6,204,112) in the record as evidence.

Dependent claims 4,5, and 7 differ from Heo by using various dimensions of the features (e.g., thickness or depth), however, they are merely a matter of choice of design depending on product requirement. Hence, it would have been obvious to one with ordinary skill in the art to use suitable thickness or depth for the feature in order to meet the product requirement.

As to dependent claims 7-10, 15, and 16, Heo teaches using doped polysilicon. therefore, it would have been obvious to one with ordinary skill in the art to use heavy doped amorphous polysilicon / hemispherical grain polysilicon because it is conventional and because Heo is not limited to any particular doped polysilicon.

The above cited claims differ from the prior art by specifying well-known features (such as thermally grown or deposited oxide in claims 2 and 19; doping method in claims 11, 17, and 22; annealing the substrate such that dopants form the buried strap diffuse into the substrate to form a buried strap diffusion and the buried strap diffusion connects the deep trench capacitor to a gate electrodes in claims 12, 13, 18, and 25; silicon nitride layer as capping layer in claim 24) to the art of semiconductor device fabrication. It is the examiner's position that a person having ordinary skill in the art at the time of the claimed invention would have found it obvious to modify Heo by adding any of same well-known features to same in order to provide their art recognized advantages and produce an expected result. It is noted that applicant did not traverse the aforementioned conventionality (e.g., well-known features), which have been stated in the office action in Paper No.3.

### ***Response to Arguments***

5. Applicant's arguments filed July 14, 2003 have been fully considered but they are not persuasive.

Applicant has argued that Heo teaches that the polysilicon layer is deposited within the trench where it is polished back by CMP. In fact, Heo teaches that the

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polysilicon layer is deposited on the surface and fills the inner space of the deep trench that forms the buried strap (col. 1, lines 49-51; 60).. The CMP is only performed to remove the polysilicon **on the pad nitride layer** (not within the trench), see col.1, lines 52-53. What is critical is that the process of Heo comprises selective deposition process for forming the buried strap as instantly claimed.

Applicant has argued that applicants' invention avoids CMP during the process of forming the buried strap. The examiner agrees that Heo does not have the limitation. However, it is noted that the features upon which applicant relies (i.e., avoid CMP) are not recited in the rejected claim(s). Although the claims are interpreted in light of the specification, limitations from the specification are not read into the claims. See *In re Van Geuns*, 988 F.2d 1181, 26 USPQ2d 1057 (Fed. Cir. 1993).

Applicant has argued that Heo's deposition is non-selective. In fact, Heo teaches the deposition applied on the surface of the pad nitride and fills the inner space of the deep trench (only deposit on specific areas, it is a "selective" process). Therefore, it is a selective deposition **which comprises** filling the inner space of the deep trench (so-called filling the collar divot in the instant claims).

### **Conclusion**

6. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

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A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kin-Chan Chen whose telephone number is (703) 305-0222. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on (703) 308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 872-9310 for regular communications and (703) 872-9311 for After Final communications. Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-2934.



Kin-Chan Chen  
Primary Examiner  
Art Unit 1765

K-C C  
August 4, 2003